

Reference Scenarios

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Reference Scenario

- Established as ‘long pole in tent’
- Provides basis for subsequent analyses
- Li383: 2T at 1.7m, 250kA plasma current

Initiate plasma	0.1 s	Provide closed flux surfaces with maximum B _t , heat with ECH
Ramp plasma current	0.125 s	Ramp plasma current to maximum value at 2MA/s <i>without q=2 surface near edge</i>
Heat to maximum beta	0.1 s	Staircase NBI to heat plasma to maximum beta
Relax plasma at constant current, beta, and toroidal field	0.2 s	Plasma current sustained by bootstrap, NBI, and inductive current drive
Ramp plasma current to zero	0.2 s	Cease plasma heating; ramp plasma current to zero

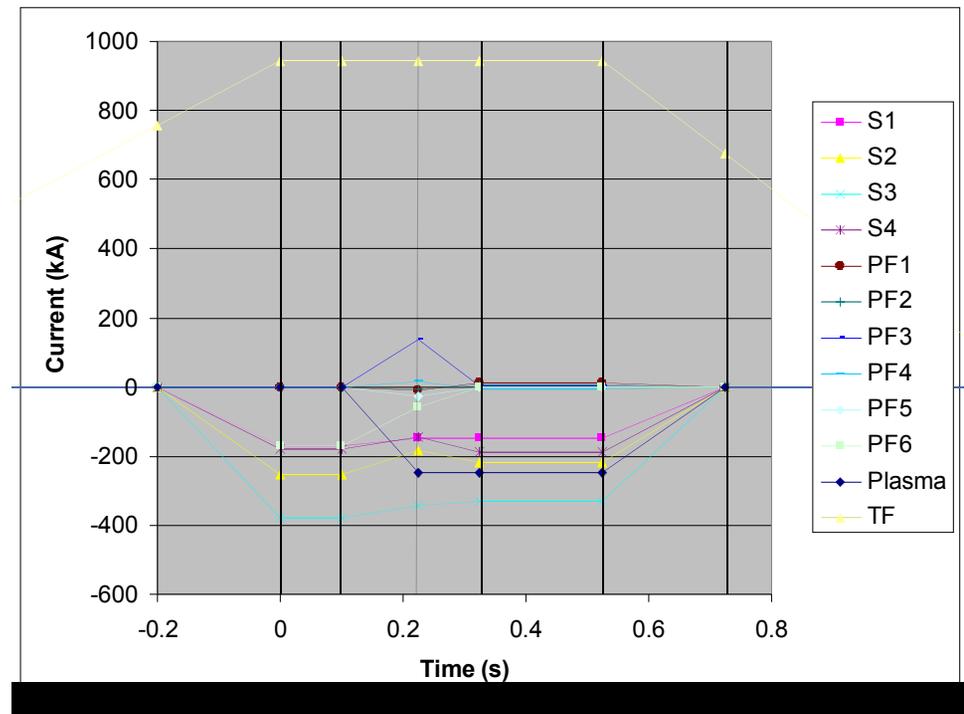
Initial current waveforms generated for saddle and modular coil options

- Comparable performance
- Improvements needed
 - Use latest version of FBO
 - Reconcile with Lazarus' simulations
 - Add Vs accounting, PF limits
 - Improve properties (esp. S2 for modular option)
 - Check for adequate surface quality
 - Ensure fit in FW boundary

	$\gamma_{\text{kink}} (10^{-4})$	$\gamma^2 B_{mn}$
Saddles		
S1	NA	54
S2	-1.1	42
S3	-0.2	38
Modulars		
S1	NA	52
S2	-9.7	62
S3	0.1	40
<i>Note: All states were ballooning stable</i>		

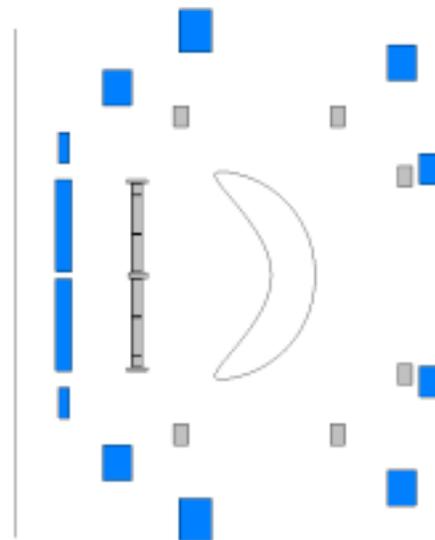
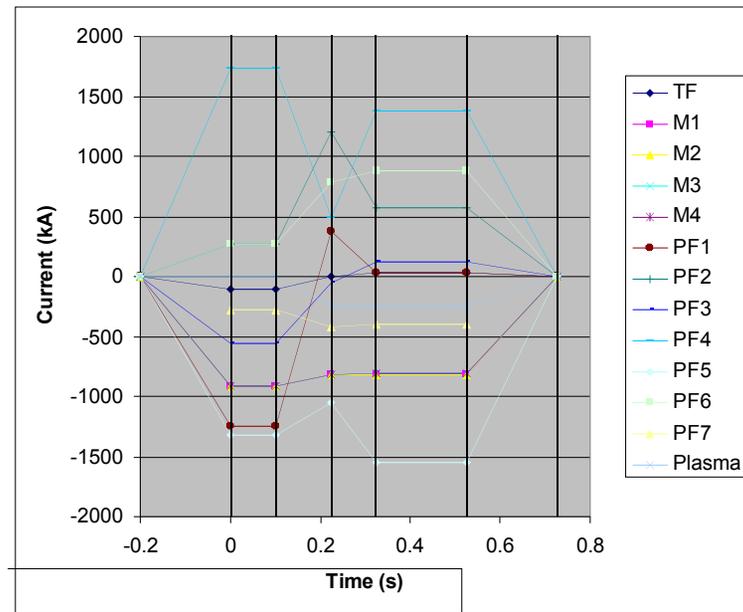
Saddle coil current waveforms

- TF current constant from 0s to 0.525s
- Saddle coils 'overdriven' to get $i_{\text{ota}} > 0.5$ everywhere at S1
- Changes in PF coil currents are very small
 - Vs accounting neglected



Modular coil current waveforms

- Modular coils ‘overdriven’ to get $i_{\text{ota}} > 0.5$ everywhere at S2
 - TF coils changing rapidly with modulars to maintain constant Bt
 - Results in higher power requirements
- PF coil currents are very large
 - Generated by StellOpt
 - Reasons are TBD
 - No penalty for large currents in StellOpt BUT
 - Larger PF coil currents required for larger separations (2-4x MAT)
 - *Implications may be severe*
 - Power, EM loads, flexibility limitations



Waveform comparison

- TF coils comparable to modulars (same MAT)
- PF coils 10x different

